

**Progress Report
Three Affiliated Tribes
Fort Berthold Reservation
Brine Release Oversight Project**

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Three Affiliated Tribes – Fort Berthold Oversight Progress Report

1.0 Introduction

This progress report has been prepared by WHPacific, Inc. (WHP) to update Three Affiliated Tribes (TAT) on the Fort Berthold Reservation Produced Water Remediation Oversight Project which is currently underway on tribal lands located within the Fort Berthold Reservation, North Dakota (Figure 1). This work has been requested by TAT in response to several releases of produced (brine) water, a by-product of oil/natural gas hydraulic fracturing operations. Pursuant to an agreement with WHP dated September 25, 2014, TAT has authorized WHP to: (1) provide technical assistance and spill response oversight in relation to the recent releases; and (2) to represent the Tribe in regulatory matters related to this situation.

To date, WHP has conducted numerous site visits and multiple sampling events which have resulted in the development of preliminary site information and analytical data as well as site survey maps relative to three documented brine water releases on Fort Berthold Reservation land. WHPacific has attended tribal and regulatory agency meetings to discuss the documented releases and appropriate response actions and has met with many individuals involved with various aspects of tribal operations, including the Tribe's Natural Resources Department, TAT Tribal Council, MHA Energy Division, MHA Environmental Protection Agency, Fort Berthold Community College, Mandaree Water Segment, Tribal legal counsel and others with relevant information or relationships to this project.

In addition to WHPacific staff, sub consultants, including Metcalf Archaeological Consultants, Inc. of Bismarck, North Dakota, Pace Analytical Services, Inc. of Billings, Montana and Ms. Tanya Driver of Fort Berthold Community College have assisted with specialized aspects of this project. Information relevant to sub consultant services conducted for this project is summarized in the following sections.

2.0 Background

In conjunction with third party oil and natural gas extraction operations in progress throughout the Fort Berthold Tribal Reservation, water is continually utilized and generated as a waste stream related to the hydraulic fracturing process. Through the fracturing process, water is injected into the Bakken Formation shale rock and the combined waste stream of flowback and produced water is created. Due to the additives included in hydraulic fracturing injectate cocktail and connate water released from the shale formation, the hydraulic fracturing waste stream is typically contaminated with salts, organic chemicals, dissolved metals and naturally occurring radioactive material. Due to the poor quality of the waste stream, off-reservation disposal via injection wells is required for all hydraulic fracturing waste stream water produced on the Fort Berthold Reservation. The responsibility for proper waste stream management and disposal lies with each oil production contractor. Typically, the waste stream water is conveyed from the point of production to the point of accumulation for transport off reservation via underground conveyance facilities. According to information provided by the Bureau of Indian Affairs (BIA) property easements define the size, type, number and use of conveyance pipelines on reservation land. To date, WHPacific is not in possession of maps or detailed information regarding the locations of subsurface pipelines.

Crestwood Mainstream Partners, LP (Crestwood) owns and maintains produced water gathering pipelines throughout the Fort Berthold Reservation. These pipelines incorporate both flexible, fiberglass type lines and steel or other rigid material fittings. A 2013 Crestwood press release indicates the Fort Berthold water conveyance system was comprised of 150 miles of pipelines which handled approximately 8,500 billion barrels of produced water per day (**Appendix A**) and the company's website (<http://www.crestwoodlp.com/operations/ngl-crude-services/crude-arrow.asp>) cites current expansion plans to increase water gathering capacities throughout the Fort Berthold Reservation to 40,000 Bbl/d (1.7 million gallons)

Between the period of July 4, 2014 and October 12, 2014, Crestwood reported three isolated releases of hydraulic fracturing waste stream water from its conveyance facilities (**Figure 1**). In each case, the released waste stream was discharged at or near the ground surface; in at least one instance, waste stream water impacted the Bear Den Creek watershed. Crestwood implemented various response actions through their consultant, Keitu Engineers and Consultants, Inc. of Mandan, North Dakota. As a result of these efforts, limited information has been provided regarding the assessment and remedial actions conducted for each release. A summary of WHPacific's understanding of each release is provided as follows:

Release 1 occurred on or about July 4, 2014 along a plateau approximately 150 vertical feet above an unnamed tributary to Lake Sakakawea (in stream reservoir of the Missouri River) in McKenzie County, North Dakota. The location of this release is identified in **Figure 3**. Available information provided by Crestwood indicates this spill involved an estimated 24,000 bbls (1 million gallons) of waste stream water. Based on visual observations and field monitoring for conductivity and other parameters, Crestwood determined the path of the release flowed from the point of discharge down slope in the Bear Den Creek watershed to beaver ponds, wetlands and ultimately an unnamed stream which flows through this area to Lake Sakakawea located to the north. Topography and additional details pertaining to the area surrounding Release 1 are provided on **Figures 2-3**.

In response to this release, Crestwood initiated the following actions:

- Fresh water was discharged to the spill area to act as a flushing agent, Crestwood estimates freshwater was applied to the spill area at a ratio of 1:1;
- Stressed and dead vegetation, was removed from its in-situ location and disposed of within the immediate spill area in either chipped or whole form;
- Rudimentary erosion control measures were applied to the spill area;
- The receiving, down gradient beaver pond and dam were modified with the installation of plastic sheeting and other measures to control further migration of the release towards Lake Sakakawea;
- Collected water was pumped from the modified beaver pond to holding facilities for transport and appropriate disposal;
- Sampling of soil and water was conducted in the vicinity of the release;
- A botanical survey of the affected area was conducted.

Pumping of the accumulated water in the beaver pond has occurred intermittently since the initial release and discovery; however, WHP has neither been provided of the volume of water removed

from this area for disposal, nor been provided with flow measurement data from Crestwood. Based on monitoring of the beaver pond for chloride levels, Crestwood has requested approval from TAT to release spring runoff from the spill area to Lake Sakakawea. Chloride levels reported within the beaver dam range from 27,200 mg/l shortly after the release (July 9, 2014) to a low concentration of 501 mg/l reported on August 25, 2014 and eight results reported for the period of September 8-23, 2014 averaged 974 mg/l. No information was provided regarding the sampling protocols or analytical methodologies used in the development of this data, consequently WHP has no means to validate this data provided by Crestwood.

Results of Crestwood's botanical inventory indicates that wooded species greater than one inch in diameter (measured at breast-height) which were lost due to Release 1 include: 165 Green Ash (*Fraxinus pennsylvanica*), three Rocky Mountain Juniper (*Juniperus scopulorum*), six Bur Oak (*Quercus macrocarpa*) and 18 American Elm (*Ulmus Americana*). WHP estimates the area of obvious vegetative impact and surface remediation efforts implemented to date by Crestwood in response to Release 1 totals approximately 5.4 acres.

Release 2 involved an estimated volume of 3,000 bbls (126,000 gallons) of produced water from a valve station of a Crestwood gathering line located approximately 13 miles northeast of Mandaree, in Dunn County, North Dakota (**Figure 1**). This release was identified on August 22, 2014 in the area immediately northeast of XTO Energy, Inc.'s WalterPackwolf 31x-12C well pad, approximately 1,800 feet horizontally and 215 feet vertically from Lake Sakakawea (**Figure 6**).

Shortly upon discovery of Release 2, the following response actions were initiated by Crestwood:

- Screening of soil conductivity levels was conducted to determine the path of the release. Information provided by Crestwood indicates spilled brine water traveled less than 1,000 feet from the point of release.
- Using soil conductivity readings as a basis for removal, impacted soil was excavated and removed from the spill area.
- Calcium sulfate was applied to the affected area at an application rate three times the recommended level for agricultural usage.
- Erosion control/moisture retention measures were implemented throughout the release area.
- Vegetation was removed from the impacted area. WHP estimates this area of vegetative impact to be approximately 0.5 acres.

Release 3 was discovered on October 12, 2014; this spill was reported to involve approximately 150 bbls (6,300 gallons) of produced/flowback water released from a valve station in the area east of Highway 22, approximately 0.6 miles south of the highway 73 intersection (**Figure 1**).

Response actions conducted by Crestwood involved:

- Pooled waste stream water was pumped from the release site for off-site disposal.
- Crestwood used soil conductivity readings as a basis for removal, impacted soil was excavated and removed from the spill area to a depth of approximately four feet below ground surface.
- Calcium sulfate was applied to the affected area at an application rate three times the recommended level for agricultural usage.

3.0 Regulatory Considerations

The Fort Berthold Reservation is a federally-recognized reservation which involves land held in trust for TAT by the Bureau of Indian Affairs. As a sovereign nation, the tribe has adopted Tribal Regulations, including the Three Affiliated Tribes Title 15 Environmental Code (January 2012) which includes provisions for spill response, notification and enforcement. Section 18 of the Environmental Code defines civil fines and penalties applicable to violations of the Environmental Code and Section 19 establishes the Tribal Response and Remedial Action Program.

Federal regulations additionally apply to the releases and associated response actions which have occurred to date at Fort Berthold Reservation including:

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA):

Section 301c– the Natural Resources Damage Assessment and Restoration Program as authorized by CERCLA allows for the restoration of Tribal Resources that have been impacted as a result of releases of hazardous substances.

Clean Water Act:

Section 401 requires clean water certifications associated with the application of various Nationwide Permits or Section 404 individual permits for activities impacting waters of the state. Pre-construction Notification is required with the use of most nationwide permits and individual permits utilized on tribal lands.

Section 402: National Pollution Discharge Elimination System requires permit coverage for activities exceeding acreage thresholds or adjacent to protected or impaired waters. Permit coverage requires filing of a Notice of Intent and preparing a Stormwater Pollution Prevention Plan listing practices, monitoring requirements, stabilization methods, and reasonable expectations for managing stormwater discharges.

Section 404: requires permits to remove or fill within jurisdictional waters and document use of Nationwide or individual permits.

Federal Safe Drinking Water Act (42 U.S.C) – principal federal law established to ensure safe drinking water for the public, and as such, establishes the standards for drinking water quality of public sources.

The New Deal (25 U.S.C.) 1934; Bureau of Indian Affairs – Trust Land Lease Agreements, establishment of authority for tribal governments to establish agreements and leases with third parties, providing authority to enforce conditions of such leases and agreements.

Native American Graves Protection and Repatriation Act (25 U.S.C 32) – establishes procedures for the inadvertent discovery or planned excavation of Native American cultural items on federal or tribal lands.

Archaeological Resources Protection Act (16 U.S.C 470) – governs the excavation of archaeological sites on federal and tribal lands in addition to the removal and disposition of resources from those sites.

National Historic Preservation Act (16 U.S.C 470) – established to preserve historical and archaeological sites in the US.

Endangered Species Act (16 U.S.C. 35) – establishes recovery and protection plans for species with reduced populations in threat of extinction. Act requires consultation to determine level of affect resulting from proposed actions.

Migratory Bird Treaty Act (16 U.S.C 703-712) – affords protection of nesting birds, eggs and chicks during nesting season, including removal of nests with viable eggs, causing relocation of young immature chicks.

In response to the recent releases, formal requests for information were issued to Crestwood by, USEPA Region 8 and US Department of the Interior, Bureau of Indian Affairs. WHPacific is not aware of any information provided by Crestwood in response to agency requests.

7. Due to the designation of involved lands as reservation land held in trust by the BIA, TAT is required by USEPA to secure Partner status with that agency in order to participate in the CERCLA process. To date, Partner status has not been secured by TAT.

4.0 WHPacific Work Conducted To Date

4.1 Review of Crestwood Data

Summary reports and related information for each of the reported waste stream water releases were provided by Crestwood. This information was reviewed for overall significance, appropriateness of response actions and identification of data gaps. For further evaluation, WHP conducted site visits of each release location. Based on this review and the site visits, WHP developed an understanding of the extent of each release and the primary receptors and site specific concerns associated with each location.

Information provided by Crestwood has consistently lacked details considered standard for environmental release reporting and which is necessary to effectively evaluate the potential significance of findings presented. Little or no information has been provided pertaining to sampling procedures and protocols and analytical data is limited to summaries with no specification regarding analytical methodologies, quality assurance/quality control measures or documentation. No supporting information, laboratory reports or field documentation has been provided in conjunction with the summary reports provided by Crestwood.

Despite these potential issues with data quality, Crestwood provided sample data which has been summarized by location along with WHPacific generated data on **Figures 4, 5, 8 and 11**. These data indicate elevated conductivity levels were detected in areas reported as both background and impacted containment areas in relation to Release 1. Metals including arsenic, barium, beryllium, cadmium, chromium and lead were also reported in

background and down gradient water samples at levels which exceed both Maximum Contaminant Levels for drinking water and selected acute toxicity values for surface water discharges.

4.2 Response to Release 3

Upon notification of Release 3 by Crestwood on October 14, 2014, WHPacific conducted an emergency spill response visit to the release site for the purpose of documenting site conditions and sampling the released waste stream water for laboratory analysis. This work was conducted on October 16, 2014 and involved meeting with Crestwood representatives, accessing the spill site and collecting field data and observations relevant to the release.

At the time of WHP's site visit, soil immediately surrounding the release area had been excavated to a depth of approximately eight feet below the ground surface and water was actively flowing from a ruptured line below a valve station. Crestwood was in the process of pumping the pooled waste stream water for off-site disposal.

Crestwood representatives provided access to this release for the purpose of sample collection. Sample ID PW3 Hwy 22 was collected in laboratory provided glassware directly from the point of discharge from the brine water conveyance pipeline. Using standard chain of custody, documentation and sample preservation protocols, this sample was submitted to Pace Analytical Laboratory in Minneapolis, MN for laboratory analysis of total metals by USEPA method no. 6020, mercury by USEPA Method 7470, radium 226 and 228 by USEPA Methods 903.1/904 and total dissolved solids by USEPA Method 2540C. Analytical results of this sample are summarized in **Table 1** and the laboratory report is provided in **Appendix B**. Photographs taken at the time of WHPacific's site visit are provided in **Appendix C**.

Results of the Release 3 brine sample collected by WHPacific indicate elevated levels of multiple metals including arsenic, barium, cadmium and lead and radionuclides, Ra 226 and 228. Compared to brine sample results provided by Crestwood which are purported to represent Release 1 brine water (Crestwood Sample ID 19-18HC), sample PW3 Hwy 22 contained similar metal constituents at significantly lower concentrations.

4.3 Independent Sampling and Assessment

Between the period of October 16 and November 21, 2014, WHP accessed each of the three release sites for the collection of field data and sampling. Field data, including pH, temperature, salinity, conductivity, oxygen reduction potential (ORP), and dissolved oxygen (as applicable) was collected with the use of a YSI multi parameter meter and other field instrumentation and logged in a dedicated field note book along with GPS location information. Soil/sediment and water samples collected for laboratory analysis were collected with the use of dedicated, decontaminated sampling equipment and placed directly into laboratory-provided glassware. Each sample was identified with a unique sample identification and labeled with pertinent sample information. Immediately upon collection, each sample was stored on ice in a sample cooler for eventual shipment to Pace Analytical Labs. Sample parameters included total petroleum

hydrocarbons (method 8015), priority pollutant metals (method 6020), mercury (method 7471) volatile organic compounds (method 8260) polyaromatic hydrocarbons (method 8270), radium 226/228 (method 901.1) and total dissolved solids by ASTM D2974.

4.3.1 Release 1

Multiple reconnaissance efforts, sampling events and site inspections have been conducted of Release 1 by WHPacific. Sampling events have included the collection of surface water, sediment and soil samples for laboratory analysis, as well as field observation and monitoring data for indications of impacts due to released brine water. The overall approach for the evaluation of Release 1 has been to sample biased locations determined primarily by drainage patterns in an attempt to define the extent of the impact. Collectively this work has shown indications of impact to soil and surface water throughout the affected drainage area of Release 1.

Monitoring and analytical results generated by the assessment of Release 1 are summarized along with corresponding regulatory limits and screening levels in Tables 1 and 2, pertinent sampling data is additionally graphically depicted on Figures 4 and 5. Laboratory reports for this sampling are provided in **Appendix B**.

In general, data generated by WHP shows the presence of total hydrocarbons (as motor oil range and/or diesel range hydrocarbons) in soil and surface water samples collected throughout the drainage area and elevated levels of metals, including arsenic, chromium, mercury and selenium in soil. Radium 226 and 228 was detected in all soil samples collected from this area. The levels of reported Ra concentrations are below the USEPA concentration criterion for surface soil (5 pCi/g) based on human contact. However, it is unknown if a much lower number is appropriate by quantifying the ecological risk.

The detection of total hydrocarbons in soil and surface water is considered likely the result of waste stream water impact. Concentrations of metals in soil and water however are variable by geographic location. To determine the significance of the metal concentrations detected in the soil samples, quantification of the naturally-occurring background levels for the project area will be necessary.

4.3.2 Release 2

WHPacific conducted a preliminary site visit of Release 2 on October 16, 2014. A subsequent site reconnaissance visit and sampling event was conducted on November 6, 2014. These site visits included a visual assessment of the release site and surrounding area, including the shoreline of Lake Sakakawea located approximately 2,000 feet to the north. Two soil samples were collected in the vicinity of Release 2; CRT 2-1 was collected of lake shore sediments and CRT 2-2 was collected at the confluence of two distinct drainage areas directly below the release area (**Figure 8**).

Results of the soil/sediment samples are summarized on Table 2. Both samples contained metals including arsenic, barium, cadmium, mercury and selenium at levels which exceeded corresponding EPA screening levels for industrial sites. Both samples additionally contained total hydrocarbons in the motor oil and diesel ranges. Because naturally occurring background metal concentrations have not been determined for this region, the significance of the reported metal concentrations has not been assessed. Total hydrocarbons in the ranges reported are considered likely the result of human activity, either attributable to Release 2 or another contaminant source. Both samples were reported to contain radium levels below the USEPA human contact concentration criterion for surface soil (5 pCi/g).

4.3.3 Release 3

In addition to the spill response site visit and brine water sampling conducted on October 16, 2014, WHPacific conducted a follow-up site visit to the area of Release 3 on November 6, 2014. At the time of this follow-up visit, the area immediately surrounding the valve shut off and release site had been backfilled, however the outlying area of impact had been excavated to a depth of approximately four feet below the ground surface. This area surrounding the release site had yet to be backfilled or restored. Photographs of this area prior to restoration are provided in Appendix C.

WHPacific collected one soil sample from this release area for laboratory analysis. Sample CRT 3-1 was collected of residual soil from below a culvert that likely carried discharged waste stream water. Analytical results indicate this sample contained arsenic, barium, cadmium and selenium concentrations above corresponding USEPA screening levels. No detectable hydrocarbons were reported in this sample and radium was present at levels below the USEPA concentration criterion for surface soil.

4.4 Topographic Survey

Topographic surveys of each release area (area of affect) and a recently constructed access roadway to the remedial pumping operation located below Release 1 have been completed by WHPacific. The data and information generated from this task have been incorporated into topographic base maps of each area. This data and the associated maps will be integral to assessing and presenting information relevant to each spill site.

Site survey maps generated by WHPacific have been used in the development of **Figures 1- 11** incorporated into this progress report.

4.5 Tribal Representation

WHPacific has been contracted to represent the tribe in conferences and communications with the responsible parties, remediation companies and their agents. This includes facilitation and attendance at interagency meetings and meetings with responsible parties. Since October 8, 2014, the primary focus of WHPacific's Tribal Representation capacity has been to attend meetings with responsible parties to provide recommendations regarding sampling protocol and to facilitate Federal Partner Status

between MHA Nation regulatory agencies and Federal EPA, Region 8. In this capacity WHPacific participated in the following meetings:

- November 13, 2014 Tribal Council Presentation - WHPacific presented a summary of findings to the Tribal Council meeting on November 13, 2014. A limited summary of the project status was provided as laboratory analysis was pending at that time. WHPacific will be working with tribal legal counsel and our subcontractors to prepare content for future Council meetings.
- November 18, 2014 Federal Partners Meeting - A representative from WHPacific attended the Federal Partners meeting in Bismarck, North Dakota. During this meeting, the process for receiving Federal Partners Status was outlined. Ms. Cindy Beeler, USEPA Region 8 representative was identified as a key contact who can facilitate this process. WHPacific will continue to assist with this process.
- December 2, 2014 Meeting with Crestwood, Keitu, MHA Agencies and BIA - This meeting was called by Crestwood to speak with MHA Tribal agencies regarding the remediation project. WHPacific was invited by Mr. George Abe, MHA Natural Resource Program Administrator. Also in attendance were representatives from EPA Region 8 (via phone) and BIA. Agenda items discussed include:

- ✱ ➤ Crestwood's (undated) Request to Release contained water from Release 1 to Lake Sakakawea submitted to Mr. Edmund Baker of MHA EPA and Mr. Mark Herman (BIA);
- The need for Crestwood to document reporting methods and notifications (including the date, time and individuals/agencies contacted) for each release.
- Data collection methods, the sufficiency of current data collection parameters and the need for expansion of existing parameters to include radium and other substances commonly occurring in brine and produced water spills.
- The causes of Release 1, 2 and 3 were disclosed by Crestwood's Mr. Barry Holman (ESR Director, Western Division), Ms. Miranda Jones (Crestwood Representative) and Mr. Robbie McDonough (Crestwood Representative). Release 1 was disclosed in the meeting as being caused by the misalignment of an air release valve at the valve can. Release 2 and 3 were disclosed in the meeting as line strikes that were not reported by the contractor immediately upon occurrence.

A sign in sheet from this meeting is provided in Appendix D.

4.6 Agency Coordination

To date, WHPacific has facilitated and participated in tribal and regulatory agency meetings with MHA Nation Natural Resources Department, MHA Tribal Council, MHA Energy Division, MHA Environmental Protection Agency, MHA Homeland Security, Fort Berthold Community College, Bureau of Indian Affairs, Mandaree Water Segment, Tribal legal counsel, USACOE and US EPA Region 8.

- **Emergency Response Team Development Meeting, November 13th**
WHPacific attended a meeting to discuss streamlining the spill and emergency response system. In attendance were representatives from BIA, MHA Homeland Security, MHA EPA and Natural Resources. The efficiency of a centralized calling system to provide unified notification was discussed as well as funding for training and equipment to handle spill response. WHPacific will assist in emergency response training and protocol under the Incident Command System's Planning initiative.
- **Federal Partners Meeting, November 18th**
A representative from WHPacific attended the Federal Partners meeting in Bismarck, North Dakota. During this meeting, the process of obtaining Federal Partner Status was outlined for the tribe by Ms. Cindy Beeler, USEPA Region 8 representative (beeler.cindy@epa.gov). WHPacific will continue to assist in the process of MHA Nation's lead agencies obtaining Federal Partner Status.

4.7 Road Stabilization Plan/Erosion Control Plan

In response to Release 1, Crestwood implemented improvements to a beaver pond for the purpose of intercepting and collecting released brine water for disposal. To gain access to this area, Crestwood constructed an access road in the location illustrated in **Figures 2 -5**. In conjunction with the accelerated conditions under which this road was constructed and due to the topography of the area where the road traverses, significant concerns were identified regarding stability and the road's potential for erosion. To address these concerns, WHPacific developed a detailed plan to stabilize this access road and minimize the erosion potential. This plan is currently in a draft format and will be submitted to TAT upon completion of WHPacific's internal review process.

4.8 Archaeological Survey

Metcalf Archaeological Consultants, Inc. was retained to complete archaeological research, reconnaissance pedestrian surveys and reporting to identify historic, prehistoric and cultural sites within each of the three release areas. Metcalf's final report, however is currently pending input from a Tribal Monitor. It is WHPacific's understanding that Metcalf has requested this assistance from TAT.

4.9 Ethnobotanical Survey (Bear Den Creek), October 29, 2014

In order to conduct a survey of traditional medicinal plants in the area of each release site, Ms. Tanya Driver, a MHA Nation Tribal member and Professor of Ethnobotany at Fort Berthold Community College was retained to conduct an ethnobotanical assessment. This was a preliminary investigation and subsequent site visits of Release 1, 2 and 3 will need to be performed for a complete inventory. Snow covered the area of affect the week following this initial survey and subsequent visits will occur as soon as weather allows for a botanical inventory. A written report from Tanya Driver outlining her findings and recommendations from this visit is pending. See Appendix C for photographs of plants recorded in the initial inventory. A complete ethnobotanical inventory of plants will be performed and added to the Natural Resource Damage Assessment. A preliminary listing of plants recorded follows below:

- Daisy Fleabane/*Erigeron annuus*

- Green Sagewort/*Artemisia ludoviciana*
- American Bittersweet/*Celastrus scandens*
- Stiff Goldenrod/*Solidago rigida*

4.10 Training

Training conducted by WHPacific during the reporting period included a joint effort with MHA EPA on October 28, 2014. This training was conducted in the field to facilitate sampling of water in Release 1 drainages. During this on-site training, Mr. Edmund Baker's EPA team shadowed WHPacific in order to become familiar with the sampling protocols, techniques and equipment used in this assessment. In this visit we approached the drainage of Release 1 by boat and proceeded sampling upstream from Lake Sakakawea. Further collaboration and training is under way in the upcoming sampling of the Mandaree water intake. Our team will be working with Mr. Maynard Demaray of MHA Nation Public Works and Ms. Dana Price of MHA Nation Environmental Division. A formal request for water quality data from the monthly sampling at the Mandaree intake has been submitted to Mr. Demaray by WHPacific. This data will be necessary to define our sampling parameters. We are awaiting confirmation of our request from Public Works.

The WHPacific team has additionally been working with Ms. Tanya Driver and Mr. Tom Abe, Professors at Fort Berthold Community College, as well as MHA Nation lead agency members to develop a training curriculum for continuous water quality monitoring and spill response protocol. Our team is working to develop a program that is compliant with the EPA National Contingency Plan for data collection. As it stands, the training program will be administered directly to relevant MHA Agency members (for example Natural Resource Department and Tribal EPA). In the future, the program could be expanded at the discretion of MHA Nation to include training for community college students and teachers, to allow for the greatest workforce development.

5.0 Future Work

The following work is currently either underway or planned to be initiated in the short term for this project:

- Development of a written quality assurance/quality control program as it pertains to WHP led efforts. Although care has been taken to incorporate appropriate QA/QC measures into every aspect of this project, due to the urgency of the sampling and data collection tasks conducted to date, a formal QA/QC program has not yet been adopted. Future data collection efforts will include a formal QA/QC aspect to ensure the development of reliable and reproducible data which meets the stated objectives
- Drinking Water Sampling Assessment
Our team will be coordinating a sampling effort with MHA Public Works to sample drinking water at various locations within the Mandaree Segment intake, treatment and distribution system for laboratory analysis.

- **Baseline Sampling**
Development of baseline water quality and background soil data will be essential to determining the extent of contamination from the three releases and any potential releases that might occur in the future. This sampling will include sampling at key locations within Lake Sakakawea and elsewhere in the vicinity of the three release sites.
- **Training and Emergency Response**
WHPacific is in the process of designing a curriculum to provide training in the use of water quality equipment as well as recommendations for EPA approved equipment and its maintenance. In addition our team is available to assist in the development of emergency response protocols and provide training to prepare for future releases.

6.0 Recommendations

WHP offers the following recommendations for TAT with regard to ongoing aspects of this project:

- **Implement Emergency Response Plan with centralized call-in number and rotation schedule.**
- **Request Record of Reporting History for Each Spill from Crestwood**
A record of the reporting history for releases 1, 2 and 3 will illuminate any breaks in communication within the reporting protocol and provide a record of the protocols used by Crestwood to report each spill. WHPacific recommends that MHA EPA and/or MHA Pipeline Safety request a detailed record of the reporting procedure used at the time of each spill including time and date of contact and name of personnel contacted. It is unclear at this time whether the proper reporting procedures occurred, in particular for Release 3 on October 12, 2014.
- **Pursue Partner Status in EPA Actions**
In order to ensure that MHA Nation agencies have continued access to information regarding the EPA action and CERCLA process, it will be necessary to secure partner status with the Federal EPA. Ms. Cindy Beeler, USEPA Region 8 representative (beeler.cindy@epa.gov) is the USEPA contact responsible for facilitating the information request. Ms. Gwen Campbell, (gwen.campbell@epa.gov 303-312-6463), NPDES Enforcement Chief for the EPA Region 8 will also be a valuable contact in facilitating the EPA action. As disclosed by Gwen Campbell in the December 2, 2014 meeting with Crestwood, at this time the release of information is "enforcement confidential" unless Crestwood approves a release of information.
- **Pursue Notification and Enforcement Action via MHA Environmental Code**
It is the recommendation of WHPacific that MHA EPA continue to pursue notification and enforcement actions with Crestwood in according to the MHA Environmental Code. WHPacific will continue to work with MHA agencies in order to integrate Federal and Tribal enforcement codes. An environmental lawyer with experience in the integration of Federal and Tribal environmental codes would be highly recommended at this time and would also help to facilitate this process.
- **Develop Administrative Order on Consent (AOC) for Crestwood Spill activities.** The AOC will contractually bind Crestwood to the spill response, detail the timelines and penalties associated

with the cleanup, and identify the necessary work items to be performed by Crestwood to ensure that the spill is properly characterized and restored to the parameters acceptable to the TAT.

- There will be significant costs to the TAT in the process of reviewing and monitoring the Crestwood activities. It is recommended that the TAT require Crestwood to establish an escrow account that is funded by Crestwood that the TAT can withdraw funds from to pay for the oversight activities. Use of an escrow account ensures that TAT does not need to bill and wait for reimbursement from Crestwood.
- Develop a continual Monitoring Program for Runoff of the Bear Den Creek Area
MHA lead environmental agencies should develop a continual monitoring program for runoff from the Bear Den Creek area (Release 1). WHPacific is available to assist in this plan.
- Fencing of Each Release Site Surrounding the Area of Affect
Each release site should be fenced by Crestwood to contain the entire area of effect to a height of at least 10 feet, in order to prevent livestock, domestic pets, humans and wildlife including deer from entering the Release sites.
- Rerouting of the watershed at Release 1 to prevent downstream transport of the spill constituents. WHPacific can work to provide technical advice on this matter. It is also the recommendation of our team that pumping of the watershed within Release 1 continue until further written notice from MHA EPA, Natural Resources and BIA or until no further action is granted.
- Implement the Interim Response Action Plan to stabilize conditions associated with the beaver pond access road currently in use in conjunction with remedial pumping operations. This plan, which was prepared by WHP, is currently undergoing internal review and will be available to TAT in the near future.

Table 1
Summary of Analytical Results
Water Samples
Fort Berthold Reservation, North Dakota

Parameter	Contaminant/Measurement	Drinking water MCL, ug/L	Release 3	Release 1							
			Sample PW3 Hwy 22	CRT1-1	CRT1-2	CRT 1-3	CRT1-4	CRT1-5	CRT1-8	CRT 1-10	
		Sample Collection Date	10/16/2014	10/28/2014	10/28/2014	10/28/2014	10/28/2014	10/29/2014	10/29/2014	10/29/2014	11/4/2014
Field Parameters	Temperature @			6.77	5.95	7,604	8.54	2.74	13.04	6.19	
	Conductivity (mS/cm)			17,380	7,604		630	8180	130,800	3,621	
	Salinity			10.17	4.18		0.31	4.48	99.65	1.9	
	pH			7.65	8.2		8.62	8.45	6.18	8.56	
	Dissolved Oxygen (mg/L)			8.33	11.15		13.09	11.54	43.5	10.81	
Total Hydrocarbons	ORP			256.4	224.6		179.6	220.5	43.5	87.2	
	Motor Oil Range (ug/L)	--	NA	310	ND		ND	310	190	ND	120
	Diesel Range (ug/L)	--	NA	320	65		ND	290	240	110	180
Volatile Organic Compounds	Various	Varies by Compound	NA	ND	ND		ND	ND	ND	ND	ND
Poly Aromatic Hydrocarbons	Various	Varies by Compound	NA	ND	ND		ND	ND	ND	ND	ND
	Arsenic (ug/L)	10	15.5	ND	ND		ND	ND	ND	ND	20
Total Metals	Barium (ug/L)	2000	4,640	62.4	32.6		61.1	1,000	413	31.8	644
	Beryllium (ug/L)	4	ND	ND	ND		ND	ND	ND	ND	ND
	Cadmium (ug/L)	5	6.4	ND	ND		ND	ND	4.0	ND	2.2
	Chromium (ug/L)	100	26.7	ND	ND		ND	ND	ND	ND	23.7
	Copper (ug/L)	1300	30	ND	ND		ND	ND	ND	ND	33.3
	Lead (ug/L)	15	60.5	ND	ND		ND	ND	ND	ND	13.6
	Nickel (ug/L)	--	38.3	17.7	ND		ND	ND	20	ND	38.6
	Selenium (ug/L)	50	ND	ND	ND		ND	ND	ND	ND	ND
	Thallium (ug/L)	--	79.1	ND	ND		ND	ND	2.4	ND	2.4
	Mercury (ug/L)	2	ND	ND	ND		ND	ND	ND	ND	ND
Radionuclides	Zinc (ug/L)	--	4300	ND	ND		ND	ND	ND	ND	132
	Ra 226	5 pCi/L	1,207 pCi/L	IV	IV		IV	IV	IV	IV	IV
	RA 228	5 pCi/L	1,441 pCi/L	IV	IV		IV	IV	IV	IV	IV
Total Dissolved Solids	TDS	500,000	NA	9,700,000	6,140,000		405,000	5,120,000	41,500,000	2,820,000	NA

indicates identified result is above a corresponding USEPA Maximum Contaminant Level for Drinking water (MCL)

NA - indicates corresponding sample was not analyzed for the identified contaminant

-- indicates no MCL exists for the identified contaminant

Samples collected by WHPacific, Inc. Analysis conducted by Pace Analytical Services, Inc.

IV - indicates insufficient sample volume was submitted to complete requested analysis

Laboratory Reports for the data summarized above are provided in Appendix B. Sample locations are identified on Figures 4 and 11.

Sample PW3 Hwy 22 represents the brine water which was released from a conveyance pipeline at Release 3

Table 2
Summary of Analytical Results
Soil and Sediment Samples
Fort Berthold Reservation, North Dakota

Parameter	Sample ID	Release 1					Release 2		Release 3 CRT 3-1	EPA Soil PGWSSL	EPA Regional Screening Levels Industrial Soil	Units
		CRT 4 B	CRT 4 C	CRT 1 SED 11	CRT 1 SED 12	CRT 1 SED 13	CRT 2-1	CRT 2-2				
Total Metals	Collection Date	10/28/2014	10/28/2014	11/4/2014	11/5/2014	11/5/2014	11/6/2014	11/6/2014	11/6/2014			
	Antimony	ND	0.76	ND	ND	ND	0.85	ND	ND	0.035	47	mg/kg
	Arsenic	8.6	71.2	10.6	9.7	16.3	34.1	8.5	9.2	0.0015	3	mg/kg
	Barium	195	330	194	181	195	185	268	176	160	22000	mg/kg
	Beryllium	0.80	0.97	0.97	0.75	0.69	1.3	0.64	0.65	1.9	230	mg/kg
	Cadmium	0.38	0.37	0.38	0.45	0.55	0.51	0.34	0.36	0.069	98	mg/kg
	Chromium	24.1	26.7	24.8	27.1	29.0	20.0	15.6	17.7			mg/kg
	Copper	29.9	42.3	29.0	34.8	35.3	34.9	16.2	15.9	2.8	4700	mg/kg
	Lead	13.3	21.2	12.0	15.1	15.5	13.5	11.3	10.5		800	mg/kg
	Mercury	0.052	0.091	0.047	0.057	ND	0.078	0.046	0.028	0.033	4	mg/kg
	Nickel	34.9	26.3	39.9	39.6	39.2	45.8	16.8	19.6	2200	2.6	mg/kg
	Selenium	1.0	2.1	1.3	1.3	1.3	2.5	1.5	1.3	0.052	580	mg/kg
	Thallium	0.23	0.28	0.20	0.3	0.32	0.24	0.25	0.29	0.014	1.2	mg/kg
	Zinc	79.1	68.7	77.1	81.4	90.4	84.3	78.1	70.3	37	35000	mg/kg
TPH (Diesel Range)	Motor Oil Range (C24-C36)	ND	32.5	ND	51.8	257	64.5	272	ND			mg/kg
	TPH-DRO (C10-C28)	ND	ND	ND	ND	94.5	19.0	60.3	ND			mg/kg
	Percent Moisture	12.0	13.5	35.7	38.9	60.6	31.7	36.4	18.9			%
Radionuclides	Radium-226	2.910 ± 1.448	4.228 ± 1.686	3.889 ± 1.634	1.500 ± 1.508	2.232 ± 1.909	3.200 ± 1.130	1.703 ± 1.653	4.073 ± 1.682	5*		pCi/g
	Radium-228	1.429 ± 0.352	1.835 ± 0.425	0.712 ± 0.252	1.696 ± 0.442	1.694 ± 0.499	1.758 ± 0.351	0.896 ± 0.258	1.692 ± 0.371	5*		pCi/g

Notes: Results highlighted in RED are above a referenced screening level

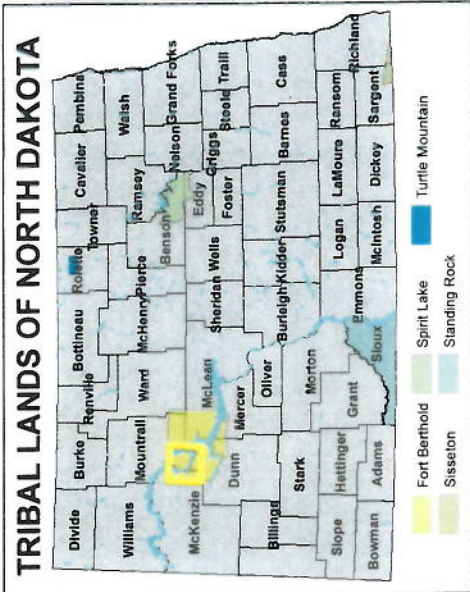
EPA Soil PGWSSL - Risk-based soil screening levels considered protective of groundwater

ND indicates not detected above the laboratory reporting limit

All samples summarized above were collected by WHPacific, Inc. Analysis conducted by Pace Analytical Services, Inc.

Sample locations are identified on Figures 5, 8 and 11. Laboratory reports are provided in Appendix B.

*5 pCi/g is USEPA's concentration criterion for surface soil



Legend

- Approximate Release Site Location
- Counties
- Roads

- Fort Berthold
- Spirit Lake
- Sisseton
- Turtle Mountain
- Standing Rock

*All release site locations are approximates, refer to individual release site maps for more information.

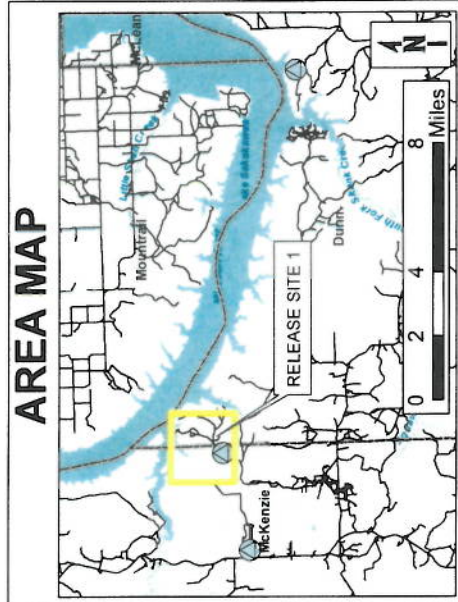
Data Sources: Background layers obtained from ND GIS Hub WMS services for Hydrography and Elevation, Tribal Lands, County Boundaries and Roads obtained from ND GIS Hub, November 2014.

FIGURE 1

Overview of Brine Water Release Site Locations

THREE AFFILIATED TRIBES
 FORT BERTHOLD RESERVATION
 NORTH DAKOTA
 PROJECT # 0005257W





Legend

- Approximate Location of Release
- Stream Center Line
- Top Of Bank
- Access Road Edge
- Access Road Centerline
- 20' Contours
- Roads

Approximate extent of surface remediation efforts implemented to date by crestwood

**Location of release was undocumented at the time the release was discovered and has since been covered by remediation efforts that occurred prior to the involvement of WHPacific.

DATA SOURCES: The release site point is the assumed approximate location of the release. The affected area, top of bank, stream, centerline and access road were surveyed by WHPacific. Twenty foot contours obtained from ND GIS Hub provided by USGS topotools, derived from the National Elevation Dataset

FIGURE 2

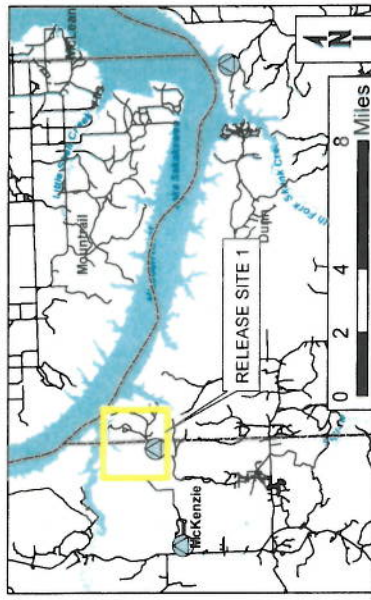
Release Site 1 Topographic Illustration

THREE AFFILIATED TRIBES
FORT BERTHOLD RESERVATION
NORTH DAKOTA
PROJECT # 0005257W





AREA MAP



Legend

- Approximate Location of Release
- Stream Center Line
- Top Of Bank
- Access Road Edge
- Access Road Centerline
- 20' Contours
- Roads
- Approximate extent of surface remediation efforts implemented to date by crestwood
- County Lines

**Location of release was undocumented at the time the release was discovered and has since been covered by remediation efforts that occurred prior to the involvement of WHPacific.

DATA SOURCES: The release site point is the assumed approximate location of the release. The affected area, top of bank, stream centerline and access road were surveyed by WHPacific Aerial photo obtained December 2014 from National Agriculture Imagery Program (NAIP) 1 meter ground sample distance ortho imagery, 2014

FIGURE 3

Release Site 1 Area of Investigation

THREE AFFILIATED TRIBES
FORT BERTHOLD RESERVATION
NORTH DAKOTA
PROJECT # 0005257W

WHPacific

December 2014

Legend

- Approximate Location of Release
- Keitu Water Sample Locations
- WHPacific Water Sample Locations
- Access Road Centerline
- Access Road Edge
- Stream Center Line
- Top Of Bank
- 20' Contours
- Roads
- Approximate extent of surface remediation efforts implemented to date by Crestwood
- County Line

All units are ug/L unless otherwise specified.
ND=Not Detected
NA= indicates corresponding sample was not analyzed for the identified contaminant.
*Keitu Sample 19-18HC represents a brine water source sample
Highlighted water analytical results indicate levels exceed drinking water MCLs. See Table 1 for further information.
**Location of release was undocumented at the time the release was discovered and has since been covered by remediation efforts that occurred prior to the involvement of WHPacific.

Samples collected by WHPacific, Inc. were collected between October 28, 2014 and November 4, 2014. All samples were analyzed by Pace Analytical Services, Inc.

All water samples collected by Keitu Engineering and Consulting, Inc. were collected on September 12, 2014.

Data Source: The release site point is the assumed approximate location of the release. The extent of surface remediation efforts implemented to date by Crestwood was ground surveyed by WHPacific, Inc. Aerial photo obtained December 2014 from the National Agriculture Imagery Program (NAIP) 1 meter ground sample distance ortho imagery, 2014.

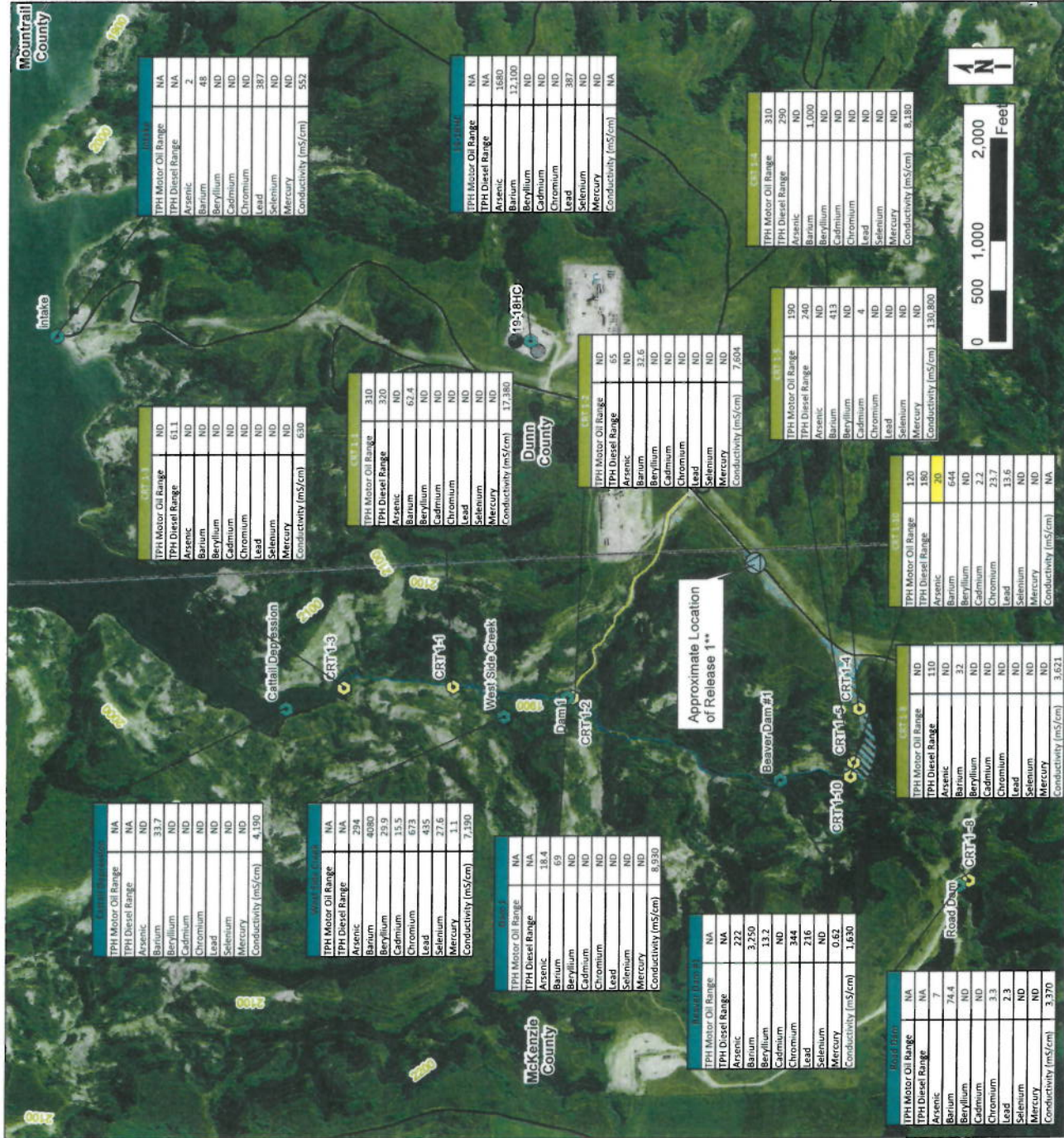
FIGURE 4

Summary of Field and Analytical Water Data Collected by WHPacific and Keitu-Release 1

THREE AFFILIATED TRIBES
FORT BERTHOUD RESERVATION
NORTH DAKOTA
PROJECT # 0005257W



December 2014



Legend

- Approximate Location of Release
- Keitu Soil Sample Locations
- WHPacific Soil Sample Locations
- Access Road Centerline
- Access Road Edge
- Stream Center Line
- Top Of Bank
- 20' Contours
- Roads
- Approximate extent of surface remediation efforts implemented to date by Crestwood
- County Line

Sample Name
Soil Conductivity (mmhos/cm)

All units for are mg/kg unless otherwise specified.
ND=Not Detected
TPH=Total Petroleum Hydrocarbons
Highlighted analytical results indicate one or more screening level was exceeded. See Table 2 for additional information.
**Location of release was undocumented at the time the release was discovered and has since been covered by remediation efforts that occurred prior to the involvement of WHPacific.
Soil samples collected by WHPacific, Inc. were collected between October 28, 2014 and November 5, 2014. All samples were analyzed by Pace Analytical Services, Inc.

Data Source: The release site point is the assumed approximate location of the release. The extent of surface remediation efforts implemented to date by Crestwood was ground surveyed by WHPacific, Inc. Aerial photo obtained December 2014 from the National Agriculture Imagery Program (NAIP) 1 meter ground sample distance ortho imagery, 2014.

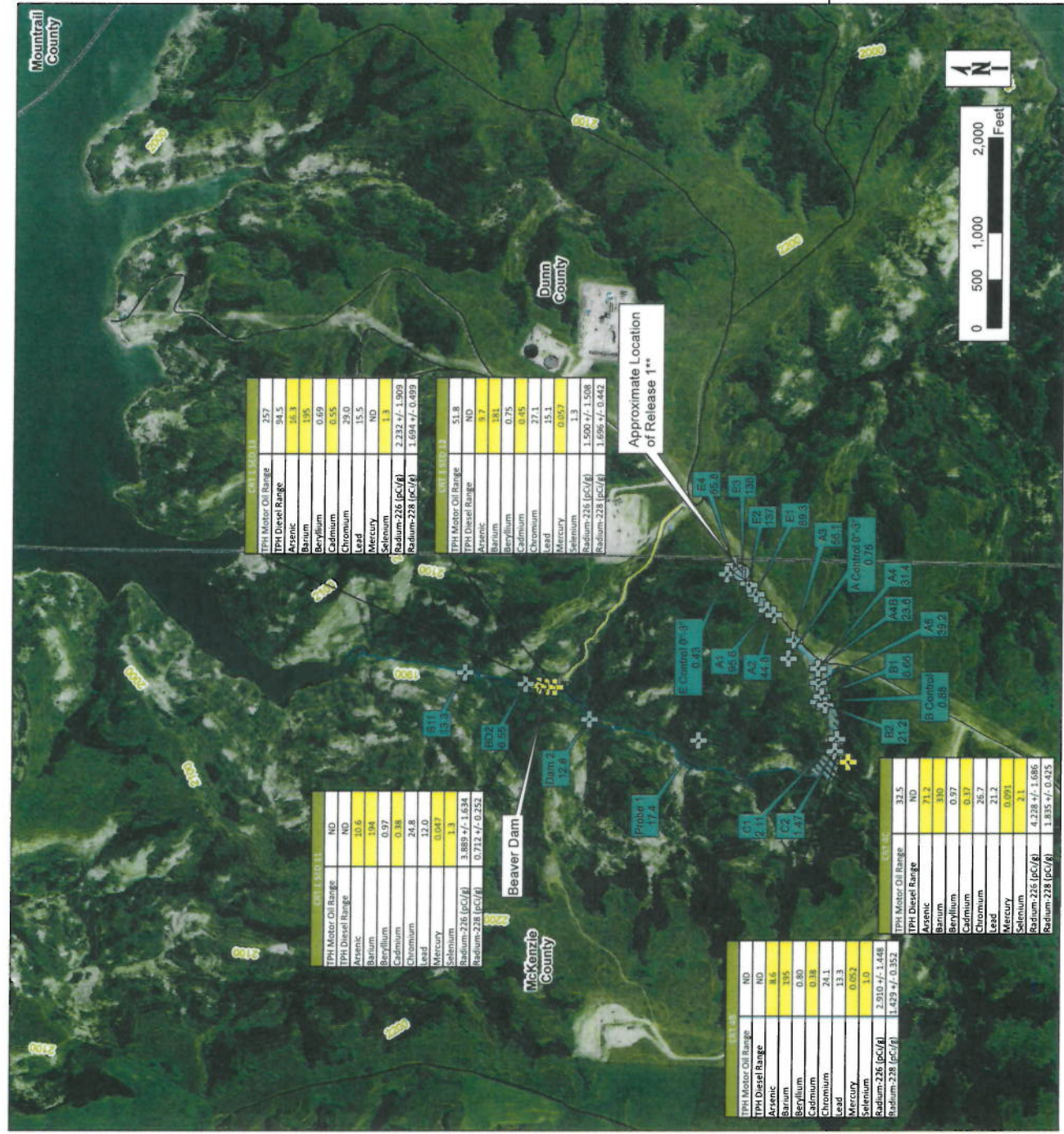
FIGURE 5

Summary of Field and Analytical Soil Data Collected by WHPacific and Keitu-Release 1

THREE AFFILIATED TRIBES
FORT BERTHOLD RESERVATION
NORTH DAKOTA
PROJECT # 0005257W

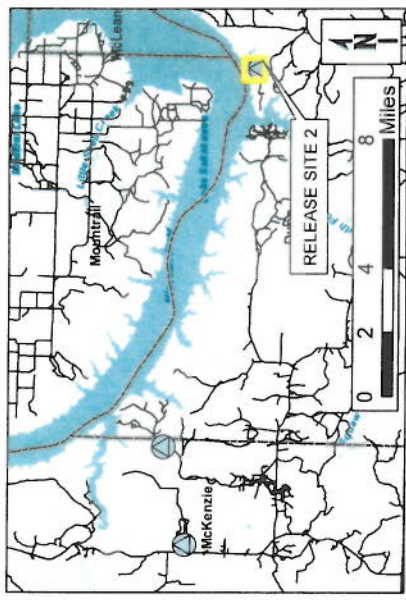


December 2014





AREA MAP



Legend

- Approximate Location of Release
- 20' Contours
- Roads
- County Lines
- Approximate extent of surface remediation efforts implemented to date by Crestwood

Data Source: The release site point is the assumed approximate location of the release. The extent of surface remediation efforts implemented to date by Crestwood was ground surveyed by WHPacific, Inc. Aerial photo obtained December 2014 from the National Agriculture Imagery Program (NAIP) 1 meter ground sample distance ortho imagery, 2014.

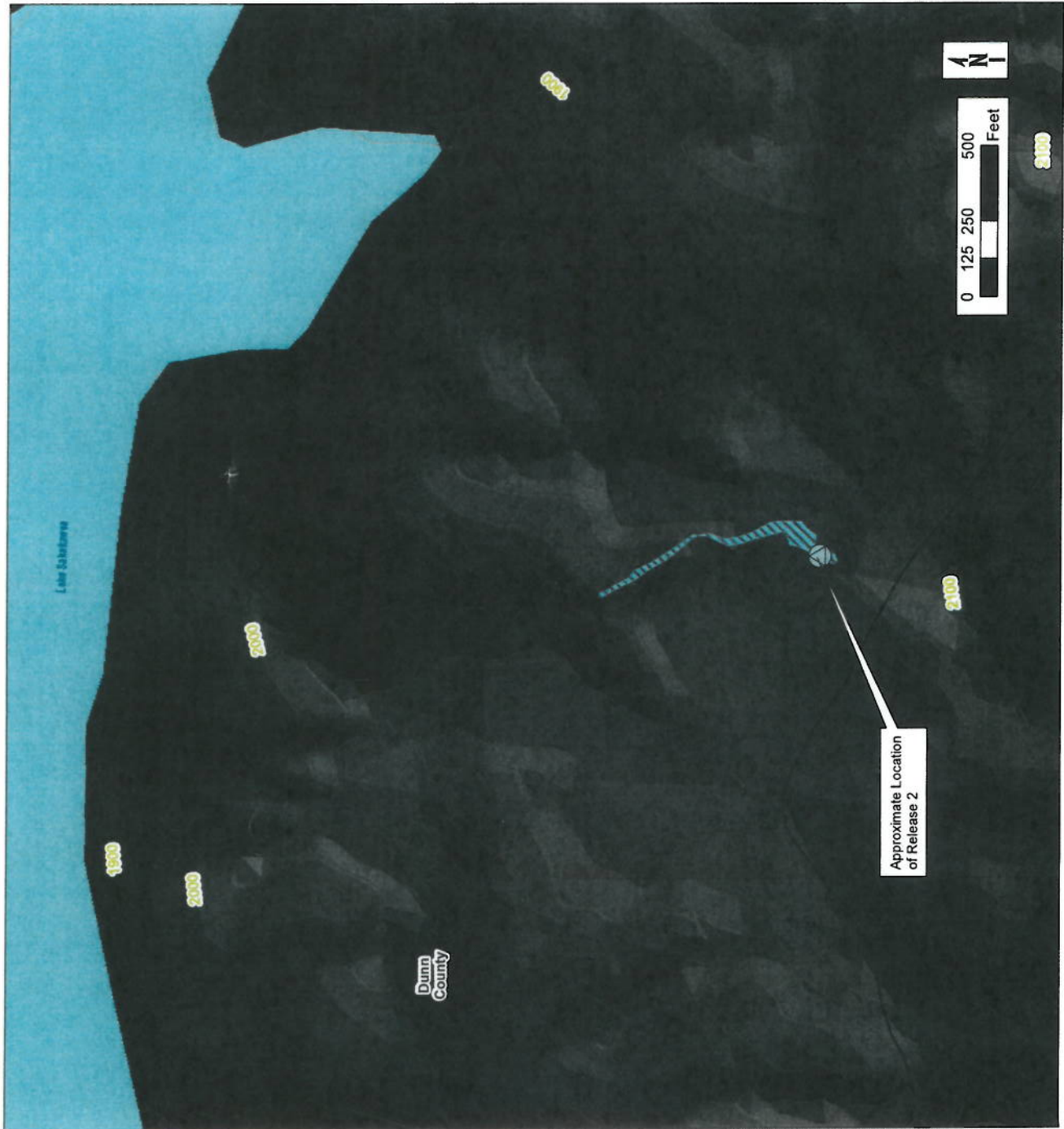
FIGURE 6

Release Site 2 Area of Investigation

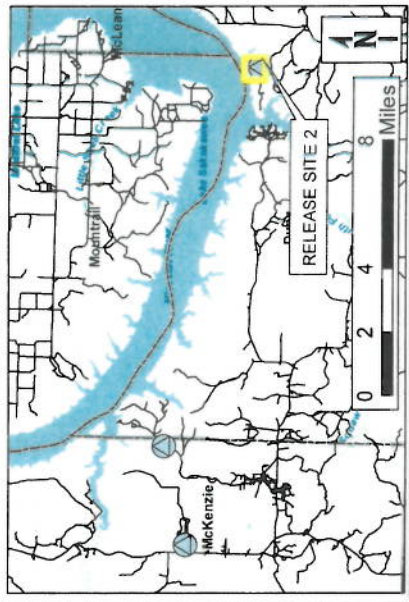
THREE AFFILIATED TRIBES
FORT BERTHOLD RESERVATION
NORTH DAKOTA
PROJECT # 0005257W

WHPacific






December 2014



AREA MAP



Legend

-  Approximate Location of Release
-  20' Contours
-  Roads
-  County Lines
-  Approximate extent of surface remediation efforts implemented to date by Crestwood

Data Source: The release site point is the assumed approximate location of the release. The extent of surface remediation efforts implemented to date by Crestwood was ground surveyed by WHPacific, Inc. Twenty foot contours obtained from ND GIS Hub WMS Elevation Service, made available through USGS topotools, derived from National Elevation Dataset.

FIGURE 7

Release Site 2 Topographic Illustration

THREE AFFILIATED TRIBES
FORT BERTHOLD RESERVATION
NORTH DAKOTA
PROJECT # 0005257W

WHPacific

December 2014

Legend

- Approximate Location of Release
- Keitu Soil Sample Locations
- WHPacific Soil Sample Locations
- 20' Contours
- Roads
- Approximate extent of surface remediation efforts implemented to date by Crestwood
- County Lines
- Sample Name
- Soil Conductivity (mmhos/cm)

All units are ug/L unless otherwise specified.

TPH= Total Petroleum Hydrocarbons

Highlighted analytical results indicate one or more screening level was exceeded. See Table 2 for additional information.

Soil Samples collected by WHPacific, Inc. were collected November 6, 2014. All samples were analyzed by Pace Analytical Services Inc.

Soil Samples collected by Keitu Engineering and Consulting, Inc. were collected on August 22, 2014, prior to remediation efforts. Results for metals were either not tested or not reported.

Data Source: The release site point is the assumed approximate location of the release. The extent of surface remediation efforts implemented to date by Crestwood was ground surveyed by WHPacific, Inc. Aerial photo obtained December 2014 from the National Agriculture Imagery Program (NAIP) 1 meter ground sample distance ortho imagery, 2014.

FIGURE 8

Summary of Field and Analytical Soil Data
Collected by WHPacific and Keitu- Release 2

THREE AFFILIATED TRIBES
FORT BERTHOLD RESERVATION
NORTH DAKOTA
PROJECT # 0005257W

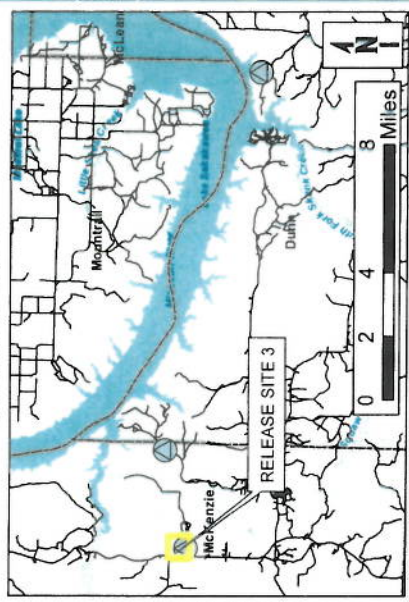
WHPacific

December 2014





AREA MAP



Legend

- Approximate Location of Release
- 20' Contours
- Gravel
- Stream
- Top of Ditch
- Roads
- County Lines

Approximate extent of surface remediation efforts implemented to date by Crestwood

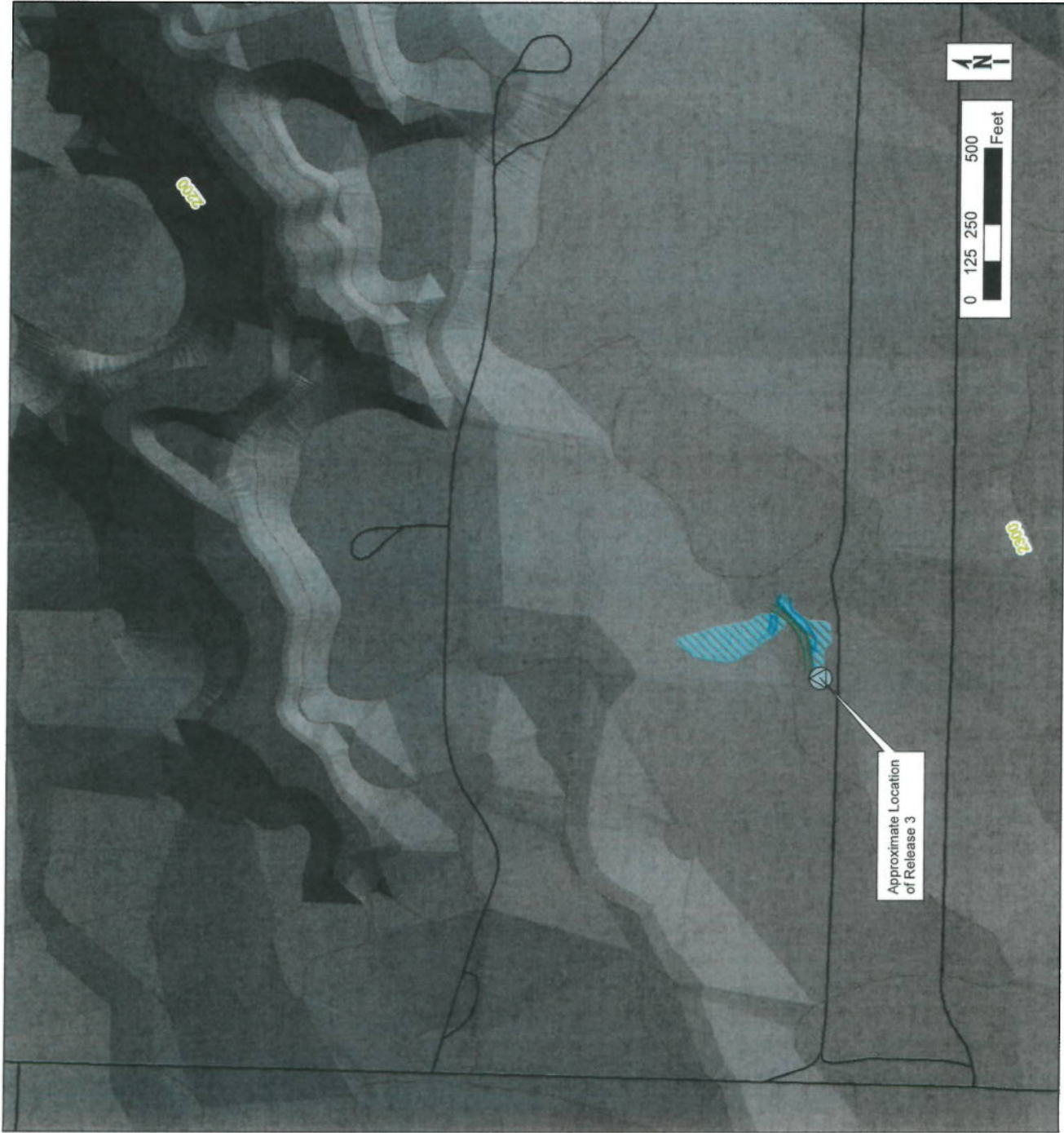
Data Source: The release site point is the assumed approximate location of the release. The extent of surface remediation efforts implemented to date by Crestwood was ground surveyed by WHPacific, Inc. Aerial photo obtained December 2014 from the National Agriculture Imagery Program (NAIP) 1 meter ground sample distance ortho imagery, 2014.

FIGURE 9

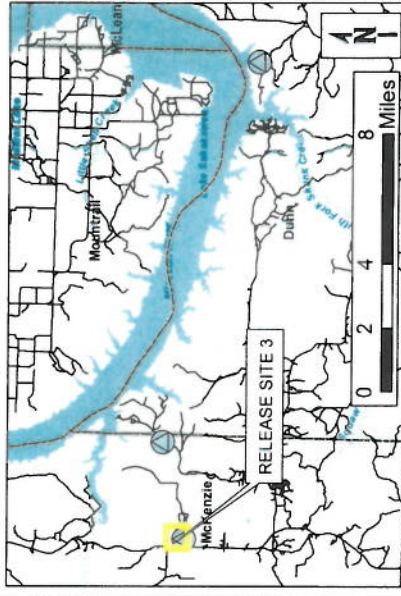
Release Site 3 Area of Investigation

THREE AFFILIATED TRIBES
FORT BERTHOLD RESERVATION
NORTH DAKOTA
PROJECT # 0005257W





AREA MAP



Legend

Approximate Location of Release

20' Contours

Gravel

Stream

Top of Ditch

Roads

County Lines

Approximate extent of surface remediation efforts implemented to date by Crestwood

Data Source: The release site point is the assumed approximate location of the release. The extent of surface remediation efforts implemented to date by Crestwood was ground surveyed by WHPacific, Inc. Twenty foot contours obtained from ND GIS Hub WMS Elevation Service, made available through USGS topotools, derived from National Elevation Dataset.

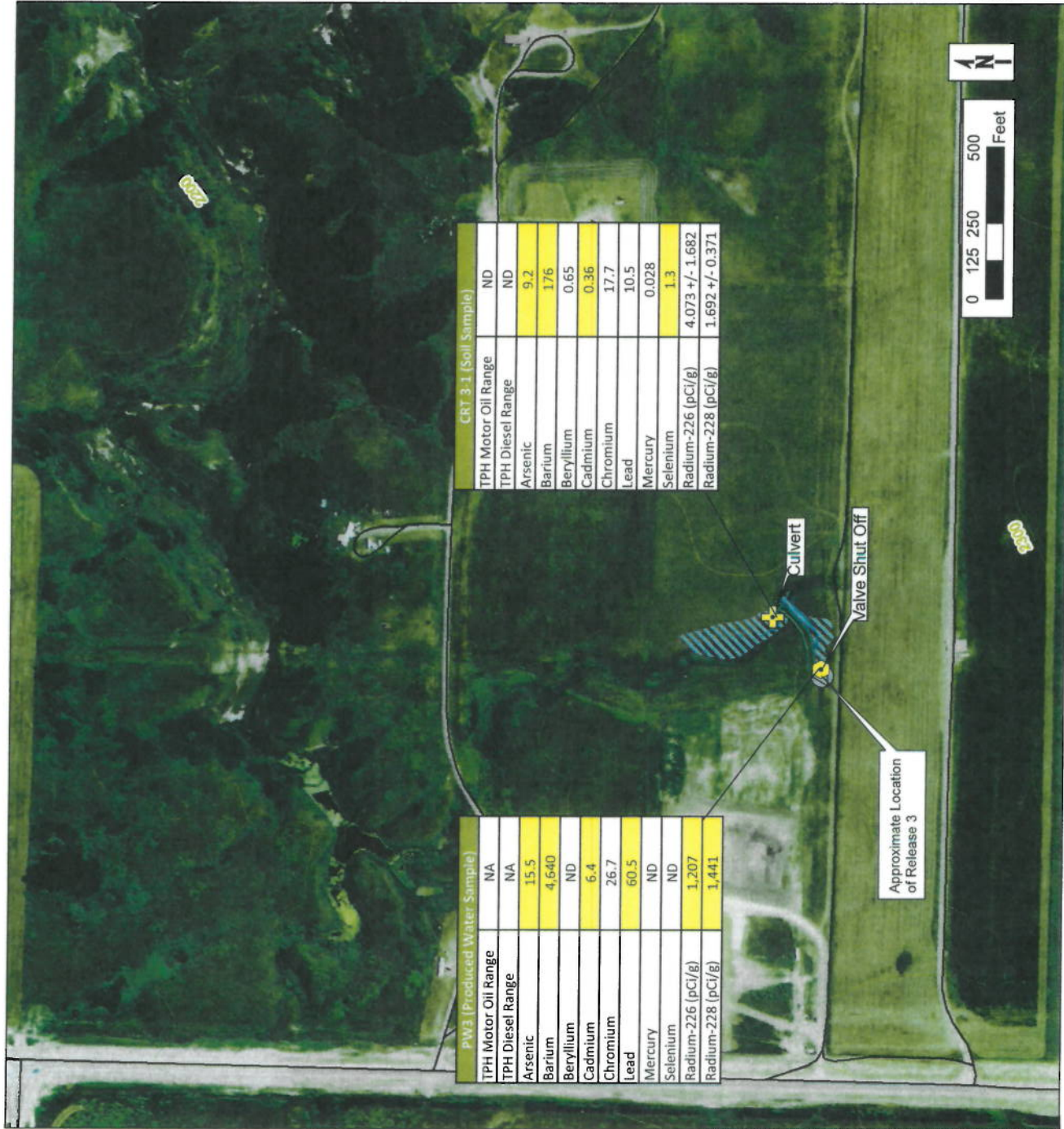
FIGURE 10

Release Site 3 Topographic Illustration

THREE AFFILIATED TRIBES
FORT BERTHOLD RESERVATION
NORTH DAKOTA
PROJECT # 0005257W

WHPacific

December 2014



Legend

- Approximate Location of Release
- WHPacific Soil Sample Location
- WHPacific Water Sample Location

20' Contours

Gravel

Stream

Top of Ditch

Roads

County Lines

Approximate extent of surface remediation efforts implemented to date by Crestwood

All water sample units are ug/L and all soil sample units are mg/kg unless otherwise specified.

TPH= Total Petroleum Hydrocarbons

ND= Not Detected

NA= Corresponding sample was not analyzed for the identified contaminant.

Highlighted soil analytical results indicate one or more screening level was exceeded (See Table 2). Highlighted water analytical results indicate levels exceed drinking water MCLs (See Table 1). Samples collected by WHPacific, Inc. were collected October 16, 2014. All samples were analyzed by Pace Analytical Services Inc.

Data Source: The release site point is the assumed approximate location of the release. The extent of surface remediation efforts implemented to date by Crestwood was ground surveyed by WHPacific, Inc. Aerial photo obtained December 2014 from the National Agriculture Imagery Program (NAIP) 1 meter ground sample distance ortho imagery, 2014.

FIGURE 11

Summary of Field and Analytical Soil and Water Data Collected by WHPacific- Release 3

THREE AFFILIATED TRIBES
FORT BERTHOLD RESERVATION
NORTH DAKOTA
PROJECT # 0005257W

WHPacific

December 2014